

**REGION 10 ANNOTATED VERSION -- JUNE 12, 2000**  
**DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION**

Interim Final 2/5/99

**RCRA Corrective Action**  
**Environmental Indicator (EI) RCRIS code (CA725)**

**Current Human Exposures Under Control**

**Facility Name:** Boeing Everett  
**Facility Address:** 3003 W. Casino Road, Everett, WA  
**Facility EPA ID #:** WAD041585464

1. Has **all** available relevant/significant information on known and reasonably suspected releases to soil, groundwater, surface water/sediments, and air, subject to RCRA Corrective Action (e.g., from Solid Waste Management Units (SWMU), Regulated Units (RU), and Areas of Concern (AOC)), been **considered** in this EI determination?

  X   If yes - check here and continue with #2 below.

       If no - re-evaluate existing data, or

       If data are not available skip to #6 and enter "IN" (more information needed) status code.

EI determinations are intended to be a "snapshot" of current site conditions, and should NOT require additional data to be gathered at the time an EI determination is made. Even if available data are clearly insufficient to determine the nature and extent of contamination or whether cleanup standards are met, it is perfectly acceptable to check "yes" for question #1 as long as whatever data currently available has been considered. When data currently available are considered but are insufficient for EI determinations, such a conclusion should be indicated in question 3 for pathways and question 4 for exposures.

Note: Even though only currently available data should be used for EI determinations, the process of making EI determinations may well identify data gaps that need to be filled through the corrective action process.

**BACKGROUND**

**Definition of Environmental Indicators (for the RCRA Corrective Action)**

Environmental Indicators (EI) are measures being used by the RCRA Corrective Action program to go beyond programmatic activity measures (e.g., reports received and approved, etc.) to track changes in the quality of the environment. The two EI developed to-date indicate the quality of the environment in relation to current human exposures to contamination and the migration of contaminated groundwater. An EI for non-human (ecological) receptors is intended to be developed in the future. \_\_\_\_\_

**Definition of "Current Human Exposures Under Control" EI**

A positive "Current Human Exposures Under Control" EI determination ("YE" status code) indicates that there are no "unacceptable" human exposures to "contamination" (i.e., contaminants in concentrations in excess of appropriate risk-based levels) that can be reasonably expected under current land- and groundwater-use conditions (for all "contamination" subject to RCRA corrective action at or from the identified facility (i.e., site-wide)).

**Relationship of EI to Final Remedies**

While Final remedies remain the long-term objective of the RCRA Corrective Action program the EI are near-term objectives which are currently being used as Program measures for the Government Performance and Results Act of 1993, GPRA). The "Current Human Exposures Under Control" EI are for reasonably expected human exposures under current land- and groundwater-use conditions ONLY, and do not consider potential future land- or groundwater-use conditions or ecological receptors. The RCRA Corrective Action program's overall mission to protect human health and the environment requires that Final remedies address these issues (i.e., potential future human exposure scenarios, future land and groundwater uses, and ecological receptors).

**Current Human Exposures Under Control**  
**Environmental Indicator (EI) RCRIS code (CA725)**

Page 2

**Duration / Applicability of EI Determinations**

EI Determinations status codes should remain in RCRIS national database ONLY as long as they remain true (i.e., RCRIS status codes must be changed when the regulatory authorities become aware of contrary information).

2. Are groundwater, soil, surface water, sediments, or air **media** known or reasonably suspected to be **“contaminated”**<sup>1</sup> above appropriately protective risk-based “levels” (applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria) from releases subject to RCRA

In many cases, available sampling and analytical data will be insufficient to fully document whether or not contaminant levels in the various media are above or below appropriate risk-based levels. For purposes of making EI determinations, it is entirely appropriate to use sound professional judgment as to whether particular media are or are not contaminated. For example, at a site with metal contamination in groundwater, professional judgment could easily be used to determine that no air (indoor or outdoor) contamination had occurred. This is particularly important when a phased approach is used for site characterization or corrective action - if characterization of a particular portion of a site has been deferred under a phased approach on the basis that that area is not believed to be contaminated and this belief is reasonably supported by an analysis of historical activities, processes knowledge or other information, then it is quite reasonable to conclude that media in that area are not “contaminated” as part of a site-wide EI determination. Should data contradicting the initial phased-investigation presumption be gathered later in the site characterization process, it can easily be reflected in an updated EI determination. Deferral of a particular area as being low priority but still or likely to be contaminated should be reflected by a “no” or “in” EI.

Corrective Action (from SWMUs, RUs or AOCs)?

	<u>Yes</u>	<u>No</u>	<u>?</u>	<u>Rationale / Key Contaminants</u>
Groundwater	X_	___	___	trichloroethylene, vinyl chloride, xylene, ethyl benzene, toluene, hydraulic oil, and lead, are identified as the primary constituents above Washington State Model Toxics Control Act (MTCA) residential cleanup standards in the upper aquifer. TCE and vinyl chloride were found in the Esperance Sand aquifer (lower aquifer) at concentrations exceeding drinking water cleanup levels. TCE concentrations up to 2500 ppb and vinyl chloride concentrations up to 1.4 ppb were found in March 2004 newly installed groundwater wells. Characterization of the TCE groundwater plume is not complete. Source identification and characterization activities are scheduled throughout 2004.
Air (indoors) <sup>2</sup>	___	_	_X_	Additional Data on the downgradient extent of the TCE groundwater plume is required for this determination
Surface Soil (e.g., <2 ft)	_X_	___	___	Xylene, ethyl benzene, toluene, hydraulic oil, lead, and cPAHs are identified as the primary

<sup>1</sup> “Contamination” and “contaminated” describes media containing contaminants (in any form, NAPL and/or dissolved, vapors, or solids, that are subject to RCRA) in concentrations in excess of appropriately protective risk-based “levels” (for the media, that identify risks within the acceptable risk range).

<sup>2</sup> Recent evidence (from the Colorado Dept. of Public Health and Environment, and others) suggest that unacceptable indoor air concentrations are more common in structures above groundwater with volatile contaminants than previously believed. This is a rapidly developing field and reviewers are encouraged to look to the latest guidance for the appropriate methods and scale of demonstration necessary to be reasonably certain that indoor air (in structures located above (and adjacent to) groundwater with volatile contaminants) does not present unacceptable risks.

**Current Human Exposures Under Control**  
**Environmental Indicator (EI) RCRIS code (CA725)**

Page 3

Surface Water	<u>  X  </u>	<u>  </u>	<u>  </u>	constituents above MTCA residential cleanup standards. PCB contamination detected in upstream surface water portions of Powder Mill Creek exceeding unrestricted surface water cleanup levels. TCE contamination in Powder Mill Creek thus far is below unrestricted surface water cleanup levels.
Sediment	<u>  X  </u>	<u>  </u>	<u>  </u>	Lead, PCBs, and cPAHs are the primary constituents above sediment screening levels. Final sediment cleanup levels have not been established yet for these freshwater sediments.
Subsurf. Soil (e.g., >2 ft)	<u>  X  </u>	<u>  </u>	<u>  </u>	Xylene, ethyl benzene, toluene, hydraulic oil, lead, and cPAHs are identified as the primary constituents above MTCA residential cleanup standards.
Air (outdoors)	<u>  </u>	<u>  X  </u>	<u>  </u>	

       If no (for all media) - skip to #6, and enter "YE," status code after providing or citing appropriate "levels," and referencing sufficient supporting documentation demonstrating that these "levels" are not exceeded.

  X   If yes (for any media) - continue after identifying key contaminants in each "contaminated" medium, citing appropriate "levels" (or provide an explanation for the determination that the medium could pose an unacceptable risk), and referencing supporting documentation.

       If unknown (for any media) - skip to #6 and enter "IN" status code.

Rationale and Reference(s): The above information was provided based on data examined to date only. The Supplemental RI work is currently ongoing. *Refer to the August 1999 Draft Remedial Investigation Report; the August 2001 Draft Revised Remedial Investigation Report; Year 1999-2004 Quarterly Groundwater Monitoring Report; Results and Recommendations of Supplemental RI of Groundwater in Powder Mill Gulch, Boeing Everett Plant, dated June 3, 2004; and Powder Mill Gulch Supplemental Groundwater RI Results, dated April 27, 2004.*

The rationale/key contaminants should have a brief note of the "principle threat" contaminants (those that most significantly drive cleanup decisions), as well as a reference to key documents, if any. A note as to which particular risk-based standard is being used as the basis of comparison should also be included. For complex documents, a note to the particular section, table, etc. from which data or standards are selected should be provided, as it is often difficult to verify data out of context.

3. Are there **complete pathways** between "contamination" and human receptors such that exposures can be reasonably expected under the current (land- and groundwater-use) conditions?

Summary Exposure Pathway Evaluation Table

Potential **Human Receptors** (Under Current Conditions)

<b>"Contaminated" Media</b>	Residents	Workers	Day-Care	Construction	Trespassers	Recreation	Food <sup>3</sup>
Groundwater	<u>  </u>	<u>  </u>	<u>  </u>	<u>  </u>			<u>  </u>
Air (indoors)	<u>  ?</u>	<u>  </u>	<u>  </u>	<u>  </u>			
Soil (surface, e.g., <2 ft)	<u>  </u>	<u>  </u>	<u>  </u>	<u>  </u>	<u>  </u>	<u>  </u>	<u>  </u>
Surface Water	<u>  </u>	<u>  </u>			<u>  </u>	<u>  </u>	<u>  </u>
Sediment	<u>  </u>	<u>  </u>			<u>  </u>	<u>  </u>	<u>  </u>
Soil (subsurface e.g., >2 ft)				<u>  </u>			<u>  </u>
Air (outdoors)	<u>  </u>	<u>  </u>	<u>  </u>	<u>  </u>	<u>  </u>		

<sup>3</sup> Indirect Pathway/Receptor (e.g., vegetables, fruits, crops, meat and dairy products, fish, shellfish, etc.)

**Current Human Exposures Under Control**  
**Environmental Indicator (EI) RCRIS code (CA725)**

Page 4

Instructions for Summary Exposure Pathway Evaluation Table:

1. Strike-out specific Media including Human Receptors' spaces for Media which are not "contaminated") as identified in #2 above.
2. Enter "yes" or "no" for potential "completeness" under each "Contaminated" Media -- Human Receptor combination (Pathway).

Note: In order to focus the evaluation to the most probable combinations some potential "Contaminated" Media - Human Receptor combinations (Pathways) do not have check spaces ("\_\_\_"). While these combinations may not be probable in most situations they may be possible in some settings and should be added as necessary.

- \_\_\_ If no (pathways are not complete for any contaminated media-receptor combination) - skip to #6, and enter "YE" status code, after explaining and/or referencing condition(s) in-place, whether natural or man-made, preventing a complete exposure pathway from each contaminated medium (e.g., use optional Pathway Evaluation Work Sheet to analyze major pathways).
- \_\_\_ If yes (pathways are complete for any "Contaminated" Media - Human Receptor combination) - continue after providing supporting explanation.
- X** If unknown (for any "Contaminated" Media - Human Receptor combination) - skip to #6 and enter "IN" status code

For sediments (if not other media like surface or groundwater), exposure should consider the potential for subsistence food source exposures, in addition to traditional exposure routes such as direct contact or direct ingestion.

Rationale and Reference(s): Onsite receptors: Facility-wide areas of subsurface contamination will not be disturbed and the contaminated groundwater from the shallow aquifer will not be withdrawn without coordinating with the Boeing Everett Environmental Group. If any contaminated areas are disturbed for construction or remediation purposes, the Boeing Everett Health and Safety Plans will be followed to protect the workers. Offsite receptors: TCE (maximum 2500 ppb) and vinyl chloride (maximum 1.4 ppb) were found above drinking water cleanup levels in the Esperance Sand (lower) aquifer at the north end of the facility. The maximum TCE and vinyl chloride concentrations were found at deeper portions of the aquifer. Additional groundwater sampling is planned in 2004 to delineate the extent of contamination, including the downgradient offsite extent of contamination. Preliminary data suggests that the upper portion of this TCE and vinyl chloride groundwater plume may quickly attenuate to below applicable health risk based levels, however, future 2004 groundwater data will need to verify this assumption. Based on recent information, there appear to be no use of the Esperance Sand aquifer for domestic purposes within in the area of Powder Mill Gulch. The other offsite receptor is the Puget Sound further north. *Refer to the August 1999 Draft Remedial Investigation Report; the August 2001 Draft Revised Remedial Investigation Report; Year 1999-2004 Quarterly Groundwater Monitoring Report; Results and Recommendations of Supplemental RI of Groundwater in Powder Mill Gulch, Boeing Everett Plant, dated June 3, 2004; and Powder Mill Gulch Supplemental Groundwater RI Results, dated April 27, 2004.*

- 4 Can the **exposures** from any of the complete pathways identified in #3 be reasonably expected to be **"significant"**<sup>4</sup> (i.e., potentially "unacceptable" because exposures can be reasonably expected to be: 1) greater in magnitude (intensity, frequency and/or duration) than assumed in the derivation of the acceptable "levels" (used to identify the "contamination"); or 2) the combination of exposure magnitude (perhaps even though low) and contaminant concentrations (which may be substantially above the acceptable "levels") could result in greater than acceptable risks)?

<sup>4</sup> If there is any question on whether the identified exposures are "significant" (i.e., potentially "unacceptable") consult a human health Risk Assessment specialist with appropriate education, training and experience.

**Current Human Exposures Under Control**  
**Environmental Indicator (EI) RCRIS code (CA725)**

Page 5

In general, EI's (if not cleanup standards themselves) can be met through a combination of reduction of contaminant concentrations (assuming that concentrations have been unacceptable) and (physical) engineering or institutional controls that interrupt an exposure pathway. For purposes of EI determinations, however, institutional or engineering controls do not need to have the sophistication, permanence, or legal defensibility as would be necessary for a final corrective action remedy. Rather, they need to be functional and reasonable - should the controls later be found to be no longer effective, the finding can easily be reflected in an updated EI determination.

An example might be the existence of off-site groundwater contamination that might pose risks to utility workers outside of the facility boundary. In this instance, evidence of an agreement between the facility and the utility that excavations would not occur in the contaminated area without appropriate protective gear would be acceptable for meeting the human exposures controlled EI.

\_\_\_\_\_ If no (exposures can not be reasonably expected to be significant (i.e., potentially "unacceptable") for any complete exposure pathway) - skip to #6 and enter "YE" status code after explaining and/or referencing documentation justifying why the exposures (from each of the complete pathways) to "contamination" (identified in #3) are not expected to be "significant."

\_\_\_\_\_ If yes (exposures could be reasonably expected to be "significant" (i.e., potentially "unacceptable") for any complete exposure pathway) - continue after providing a description (of each potentially "unacceptable" exposure pathway) and explaining and/or referencing documentation justifying why the exposures (from each of the remaining complete pathways) to "contamination" (identified in #3) are not expected to be "significant."

\_\_\_\_\_ If unknown (for any complete pathway) - skip to #6 and enter "IN" status code

Rationale and Reference(s): \_\_\_\_\_  
\_\_\_\_\_

5 Can the "significant" **exposures** (identified in #4) be shown to be within **acceptable** limits?

\_\_\_\_\_ If yes (all "significant" exposures have been shown to be within acceptable limits) - continue and enter "YE" after summarizing and referencing documentation justifying why all "significant" exposures to "contamination" are within acceptable limits (e.g., a site-specific Human Health Risk Assessment).

\_\_\_\_\_ If no (there are current exposures that can be reasonably expected to be "unacceptable") continue and enter "NO" status code after providing a description of each potentially "unacceptable" exposure.

\_\_\_\_\_ If unknown (for any potentially "unacceptable" exposure) - continue and enter "IN" status code

Rationale and Reference(s): \_\_\_\_\_  
\_\_\_\_\_

The response to this question should include a brief description of the analysis and assumptions used in arriving at whatever conclusion is reached. The description does not have to be particularly detailed, but it should allow the reader to gain a basic understanding of the reasoning employed by the decision-maker.

**Current Human Exposures Under Control  
Environmental Indicator (EI) RCRIS code (CA725)**

Page 6

6. Check the appropriate RCRIS status codes for the Current Human Exposures Under Control EI event code (CA725), and obtain Supervisor (or appropriate Manager) signature and date on the EI determination below (and attach appropriate supporting documentation as well as a map of the facility):

\_\_\_\_\_ YE - Yes, "Current Human Exposures Under Control" has been verified. Based on a review of the information contained in this EI Determination, "Current Human Exposures" are expected to be "Under Control" at the Boeing Everett facility, EPA ID # WAD041585464, located at 3003 West Casino Road, Everett, Washington under current and reasonably expected conditions. This determination will be re-evaluated when the Agency/State becomes aware of significant changes at the facility.

\_\_\_\_\_ NO - "Current Human Exposures" are NOT "Under Control."

\_\_X\_\_ IN - More information is needed to make a determination.

Completed by \_\_\_\_\_ Date: 6/21/04  
Dean Yasuda  
Environmental Engineer  
Hazardous Waste and Toxics Reduction Program  
Washington State Department of Ecology, Northwest Regional Office

Supervisor \_\_\_\_\_ Date \_\_\_\_\_  
Julie Sellick  
Hazardous Waste and Toxics Reduction Program, Section Supervisor  
Washington State Department of Ecology, Northwest Regional Office

Locations where References may be found:

- (1) Washington State Department of Ecology-Central Files Office  
Northwest Regional Office  
3190 160<sup>th</sup> Ave SE  
Bellevue, WA 98008-5452  
(425) 649-7190
- (2) City of Everett  
Main Library, Information Services  
2701 Hoyt St.  
Everett, WA 98201  
(425) 257-8022

Contact telephone and e-mail numbers

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**FINAL NOTE: THE HUMAN EXPOSURES EI IS A QUALITATIVE SCREENING OF EXPOSURES AND THE DETERMINATIONS WITHIN THIS DOCUMENT SHOULD NOT BE USED AS THE SOLE BASIS FOR RESTRICTING THE SCOPE OF MORE DETAILED (E.G., SITE-SPECIFIC) ASSESSMENTS OF RISK.**

**REGION 10 ANNOTATED VERSION -- JUNE 12, 2000**  
**DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION**

Interim

Final 2/5/99

**RCRA Corrective Action**  
**Environmental Indicator (EI) RCRIS code (CA750)**

**Migration of Contaminated Groundwater Under Control**

**Facility Name:** Boeing Everett  
**Facility Address:** 3003 W. Casino Road, Everett, WA  
**Facility EPA ID #:** WAD041585464

1. Has **all** available relevant/significant information on known and reasonably suspected releases to the groundwater media, subject to RCRA Corrective Action (e.g., from Solid Waste Management Units (SWMU), Regulated Units (RU), and Areas of Concern (AOC)), been **considered** in this EI determination?

  X   If yes - check here and continue with #2 below.

       If no - re-evaluate existing data, or

       if data are not available, skip to #8 and enter "IN" (more information needed) status code.

**BACKGROUND**

**Definition of Environmental Indicators (for the RCRA Corrective Action)**

Environmental Indicators (EI) are measures being used by the RCRA Corrective Action program to go beyond programmatic activity measures (e.g., reports received and approved, etc.) to track changes in the quality of the environment. The two EI developed to-date indicate the quality of the environment in relation to current human exposures to contamination and the migration of contaminated groundwater. An EI for non-human (ecological) receptors is intended to be developed in the future.

**Definition of "Migration of Contaminated Groundwater Under Control" EI**

A positive "Migration of Contaminated Groundwater Under Control" EI determination ("YE" status code) indicates that the migration of "contaminated" groundwater has stabilized, and that monitoring will be conducted to confirm that contaminated groundwater remains within the original "area of contaminated groundwater" (for all groundwater "contamination" subject to RCRA corrective action at or from the identified facility (i.e., site-wide)).

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**Relationship of EI to Final Remedies**

While Final remedies remain the long-term objective of the RCRA Corrective Action program the EI are near-term objectives which are currently being used as Program measures for the Government Performance and Results Act of 1993, GPRA). The "Migration of Contaminated Groundwater Under Control" EI pertains ONLY to the physical migration (i.e., further spread) of contaminated groundwater and contaminants within groundwater (e.g., non-aqueous phase liquids or NAPLs). Achieving this EI does not substitute for achieving other stabilization or final remedy requirements and expectations associated with sources of contamination and the need to restore, wherever practicable, contaminated groundwater to be suitable for its designated current and future uses.

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**Current Human Exposures Under Control**  
**Environmental Indicator (EI) RCRIS code (CA750)**

Page 2

**Duration / Applicability of EI Determinations**

EI Determinations status codes should remain in RCRIS national database ONLY as long as they remain true (i.e., RCRIS status codes must be changed when the regulatory authorities become aware of contrary information).

2. Is **groundwater** known or reasonably suspected to be “**contaminated**”<sup>1</sup> above appropriately protective “levels” (i.e., applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria) from releases subject to RCRA Corrective Action, anywhere at, or from, the facility?

  X   If yes - continue after identifying key contaminants, citing appropriate “levels,” and referencing supporting documentation.

       If no - skip to #8 and enter “YE” status code, after citing appropriate “levels,” and referencing supporting documentation to demonstrate that groundwater is not “contaminated.”

       If unknown - skip to #8 and enter “IN” status code.

Rationale and Reference(s): Upper aquifer: contaminated above Washington State Model Toxics Control Act (MTCA) drinking water standards, however, this shallow aquifer is not a current potable drinking water source. Furthermore, in areas where groundwater contamination, above MTCA drinking water standards, has been documented, there are groundwater extraction wells operating to hydraulically contain the groundwater plume. Deeper Aquifer (Esperance Sand): This aquifer is potable and acts as a future drinking water source. TCE (maximum 2500 ppb) and vinyl chloride (maximum 1.4 ppb) were found above drinking water cleanup levels in the Esperance Sand (lower) aquifer at the north end of the facility. Additional groundwater sampling is planned in 2004 to delineate the extent of contamination, including the downgradient offsite extent of contamination. This new groundwater data will be used to determine if the groundwater contaminant plume is expanding, shrinking or stable. *Refer to the August 1999 Draft Remedial Investigation Report; the August 2001 Draft Revised Remedial Investigation Report; Year 1999-2004 Quarterly Groundwater Monitoring Report, Results and Recommendations of Supplemental RI of Groundwater in Powder Mill Gulch, Boeing Everett Plant, dated June 3, 2004; and Powder Mill Gulch Supplemental Groundwater RI Results, dated April 27, 2004.*

3. Has the **migration** of contaminated groundwater **stabilized** (such that contaminated groundwater is expected to remain within “existing area of contaminated groundwater”<sup>2</sup> as defined by the monitoring locations designated at the time of this determination)?

       If yes - continue, after presenting or referencing the physical evidence (e.g., groundwater sampling/measurement/migration barrier data) and rationale why contaminated groundwater is expected to remain within the (horizontal or vertical) dimensions of the “existing area of groundwater contamination”<sup>2</sup>).

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<sup>1</sup> “Contamination” and “contaminated” describes media containing contaminants (in any form, NAPL and/or dissolved, vapors, or solids, that are subject to RCRA) in concentrations in excess of appropriate “levels” (appropriate for the protection of the groundwater resource and its beneficial uses).

<sup>2</sup> “existing area of contaminated groundwater” is an area (with horizontal and vertical dimensions) that has been verifiably demonstrated to contain all relevant groundwater contamination for this determination, and is defined by designated (monitoring) locations proximate to the outer perimeter of “contamination” that can and will be sampled/tested in the future to physically verify that all “contaminated” groundwater remains within this area, and that the further migration of “contaminated” groundwater is not occurring. Reasonable allowances in the proximity of the monitoring locations are permissible to incorporate formal remedy decisions (i.e., including public participation) allowing a limited area for natural attenuation.

**Current Human Exposures Under Control**  
**Environmental Indicator (EI) RCRIS code (CA750)**

Page 3

\_\_\_\_\_ If no (contaminated groundwater is observed or expected to migrate beyond the designated locations defining the “existing area of groundwater contamination”<sup>2</sup>) - skip to #8 and enter “NO” status code, after providing an explanation.

  X   If unknown - skip to #8 and enter “IN” status code.

This question focuses ONLY on the movement of contaminated groundwater, not the level of contamination. A “YES” response should be arrived at if, through interpretation of groundwater flow data or sound professional judgment, groundwater contamination can be shown to not be expanding in spatial extent. It is perfectly acceptable to have a “YE” groundwater EI if:

- 1) contaminated groundwater is located off-site but not migrating further;
- 2) contaminated groundwater is contaminated above cleanup standards, but not migrating further;
- 3) natural attenuation is occurring such that the rate of attenuation (through any of the acceptable attenuation mechanisms and in accordance with EPA’s Monitored Natural Attenuation Guidance, Directive 9200.4-17 - December 1997 Use of Monitored Natural Attenuation at Corrective Action Sites) is such that the outer boundaries of the plume are not expanding.

Rationale and Reference(s): Upper aquifer: Contaminated above Washington State Model Toxics Control Act (MTCA) drinking water standards, however, this shallow aquifer is not a current potable drinking water source. Furthermore, in areas where groundwater contamination has been documented, there are groundwater extraction wells operating to hydraulically contain the groundwater plume. Deeper Aquifer (Esperance Sand): This aquifer is a potable and future drinking water source. TCE (maximum 2500 ppb) and vinyl chloride (maximum 1.4 ppb) were found above drinking water cleanup levels in the Esperance Sand (lower) aquifer at the north end of the facility. Additional groundwater sampling is planned in 2004 to delineate the extent of contamination, including the downgradient offsite extent of contamination. This new groundwater data will be used to determine if the groundwater contaminant plume is expanding, shrinking or stable. After the extent of the downgradient TCE and vinyl chloride groundwater plume is determined, it will required several quarters of groundwater data to determine if migration is under control. Collection of this data may likely extend beyond September 2005.

*Refer to the August 1999 Draft Remedial Investigation Report; the August 2001 Draft Revised Remedial Investigation Report; Year 1999-2004 Quarterly Groundwater Monitoring Report; Results and Recommendations of Supplemental RI of Groundwater in Powder Mill Gulch, Boeing Everett Plant, dated June 3, 2004; and Powder Mill Gulch Supplemental Groundwater RI Results, dated April 27, 2004.*

## Page 4

If yes - continue after identifying potentially affected surface water bodies.

If unknown - skip to #8 and enter "IN" status code.

Rationale and Reference(s):

This image shows a single sheet of white paper with horizontal blue or grey ruling lines. The lines are evenly spaced and run across the width of the page. There are approximately 20 lines visible. The paper has a slight shadow on the right side, suggesting it's resting on a surface.

**Current Human Exposures Under Control**  
**Environmental Indicator (EI) RCRIS code (CA750)**

Page 5

5. Is the **discharge** of “contaminated” groundwater into surface water likely to be “**insignificant**” (i.e., the maximum concentration<sup>3</sup> of each contaminant discharging into surface water is less than 10 times their appropriate groundwater “level,” and there are no other conditions (e.g., the nature, and number, of discharging contaminants, or environmental setting), which significantly increase the potential for unacceptable impacts to surface water, sediments, or eco-systems at these concentrations)?

\_\_\_\_\_ If yes - skip to #7 (and enter “YE” status code in #8 if #7 = yes), after documenting: 1) the maximum known or reasonably suspected concentration<sup>3</sup> of key contaminants discharged above their groundwater “level,” the value of the appropriate “level(s),” and if there is evidence that the concentrations are increasing; and 2) provide a statement of professional judgment/explanation (or reference documentation) supporting that the discharge of groundwater contaminants into the surface water is not anticipated to have unacceptable impacts to the receiving surface water, sediments, or eco-system.

\_\_\_\_\_ If no - (the discharge of “contaminated” groundwater into surface water is potentially significant) - continue after documenting: 1) the maximum known or reasonably suspected concentration<sup>3</sup> of each contaminant discharged above its groundwater “level,” the value of the appropriate “level(s),” and if there is evidence that the concentrations are increasing; and 2) for any contaminants discharging into surface water in concentrations<sup>3</sup> greater than 100 times their appropriate groundwater “levels,” the estimated total amount (mass in kg/yr) of each of these contaminants that are being discharged (loaded) into the surface water body (at the time of the determination), and identify if there is evidence that the amount of discharging contaminants is increasing.

\_\_\_\_\_ If unknown - enter “IN” status code in #8.

Rationale and Reference(s): \_\_\_\_\_  
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<sup>3</sup> As measured in groundwater prior to entry to the groundwater-surface water/sediment interaction (e.g., hyporheic) zone.

**Current Human Exposures Under Control**  
**Environmental Indicator (EI) RCRIS code (CA750)**

Page 6

6. Can the **discharge** of “contaminated” groundwater into surface water be shown to be “**currently acceptable**” (i.e., not cause impacts to surface water, sediments or eco-systems that should not be allowed to continue until a final remedy decision can be made and implemented<sup>4</sup>)?

When considering discharge of groundwater to surface water, it is important to remember that some discharges may be considered acceptable - it is not necessary to demonstrate that there are no discharges, or that groundwater meets surface water criteria at the point of discharge, as may be the case with final cleanup levels. As with human exposures controlled and other groundwater criteria, sound professional judgment may be used in evaluating the impact of groundwater to surface water.

The GW/SW component of the 750 EI really has three parts: 1) is there a discharge; 2) is the discharge insignificant; and 3) is the discharge currently acceptable (questions 4-6, respectively). A YE EI may be obtained if appropriate responses can be made through following this three-step analysis (no discharge, discharge insignificant, or discharge acceptable, respectively). Note that the level of supporting analysis and/or data increases as you progress through these three steps - a finding that a discharge is acceptable for a particular water body requires a considerably more complex analysis than a finding that there is no discharge.

Another point to recognize is that surface water issues often involve ecological risk considerations, and that such ecological evaluations often require specialized professional evaluation. Never the less, the quantity of data and effort required for analysis of groundwater/surface water EI questions should not be significantly different than what is required for human exposures or other groundwater questions. Evaluation of surface water from an EI perspective should not require a disproportionate effort.

\_\_\_\_\_ If yes - continue after either: 1) identifying the Final Remedy decision incorporating these conditions, or other site-specific criteria (developed for the protection of the site’s surface water, sediments, and eco-systems), and referencing supporting documentation demonstrating that these criteria are not exceeded by the discharging groundwater; OR 2) providing or referencing an interim-assessment,<sup>5</sup> appropriate to the potential for impact, that shows the discharge of groundwater contaminants into the surface water is (in the opinion of a trained specialists, including ecologist) adequately protective of receiving surface water, sediments, and eco-systems, until such time when a full assessment and final remedy decision can be made. Factors which should be considered in the interim-assessment (where appropriate to help identify the impact associated with discharging groundwater) include: surface water body size, flow, use/classification/habitats and contaminant loading limits, other sources of surface water/sediment contamination, surface water and sediment sample results and comparisons to available and appropriate surface water and sediment “levels,” as well as any other factors, such as effects on ecological receptors (e.g., via bio-assays/benthic surveys or site-specific ecological Risk Assessments), that the overseeing regulatory agency would deem appropriate for making the EI determination.

\_\_\_\_\_ If no - (the discharge of “contaminated” groundwater can not be shown to be “**currently acceptable**”) - skip to #8 and enter “NO” status code, after documenting the currently unacceptable impacts to the surface water body, sediments, and/or eco-systems.

\_\_\_\_\_ If unknown - skip to 8 and enter “IN” status code.

<sup>4</sup> Note, because areas of inflowing groundwater can be critical habitats (e.g., nurseries or thermal refugia) for many species, appropriate specialist (e.g., ecologist) should be included in management decisions that could eliminate these areas by significantly altering or reversing groundwater flow pathways near surface water bodies.

<sup>5</sup> The understanding of the impacts of contaminated groundwater discharges into surface water bodies is a rapidly developing field and reviewers are encouraged to look to the latest guidance for the appropriate methods and scale of demonstration to be reasonably certain that discharges are not causing currently unacceptable impacts to the surface waters, sediments or eco-systems.

**Current Human Exposures Under Control**  
**Environmental Indicator (EI) RCRIS code (CA750)**

Page 7

Rationale and Reference(s): \_\_\_\_\_

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7. Will groundwater **monitoring** / measurement data (and surface water/sediment/ecological data, as necessary) be collected in the future to verify that contaminated groundwater has remained within the horizontal (or vertical, as necessary) dimensions of the “existing area of contaminated groundwater?”

  X   If yes - continue after providing or citing documentation for planned activities or future sampling/measurement events. Specifically identify the well/measurement locations which will be tested in the future to verify the expectation (identified in #3) that groundwater contamination will not be migrating horizontally (or vertically, as necessary) beyond the “existing area of groundwater contamination.”

\_\_\_\_\_ If no - enter “NO” status code in #8.

\_\_\_\_\_ If unknown - enter “IN” status code in #8.

Rationale and Reference(s): Groundwater monitoring will continue throughout the remedial investigation, feasibility study and final cleanup remedy selection/implementation phases. *Refer to the 1999 - 2004 Quarterly Groundwater Monitoring Reports for review of the data.*

8. Check the appropriate RCRIS status codes for the Migration of Contaminated Groundwater Under Control EI (event code CA750), and obtain Supervisor (or appropriate Manager) signature and date on the EI determination below (attach appropriate supporting documentation as well as a map of the facility).

\_\_\_\_\_ YE - Yes, “Migration of Contaminated Groundwater Under Control” has been verified. Based on a review of the information contained in this EI determination, it has been determined that the “Migration of Contaminated Groundwater” is “Under Control” at the \_\_\_\_\_ facility, EPA ID # \_\_\_\_\_, located at \_\_\_\_\_. Specifically, this determination indicates that the migration of “contaminated” groundwater is under control, and that monitoring will be conducted to confirm that contaminated groundwater remains within the “existing area of contaminated groundwater” This determination will be re-evaluated when the Agency becomes aware of significant changes at the facility.

\_\_\_\_\_ NO - Unacceptable migration of contaminated groundwater is observed or expected.

  X   IN - More information is needed to make a determination.

**Current Human Exposures Under Control**  
**Environmental Indicator (EI) RCRIS code (CA750)**

Page 8

Completed by \_\_\_\_\_ Date: 6/2104  
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Supervisor \_\_\_\_\_ Date \_\_\_\_\_  
Julie Sellick  
Hazardous Waste and Toxics Reduction Program, Section Supervisor  
Washington State Department of Ecology, Northwest Regional Office

Locations where References may be found:

- (1) Washington State Department of Ecology-Central Files Office  
Northwest Regional Office  
3190 160<sup>th</sup> Ave SE  
Bellevue, WA 98008-5452  
(425) 649-7190
- (2) City of Everett  
Main Library, Information Services  
2701 Hoyt St.  
Everett, WA 98201  
(425) 257-8022

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